AMENDMENTS TO THE CLAIMS

Claim 1 (original): A scintillation detector array for encoding energy, position and time coordinates of gamma ray interactions for use in Positron Emission Tomography imaging, said scintillation detector array comprising:

a plurality of discrete scintillator elements which interact with incident gamma rays to produce a quantifiable number of scintillation photons, wherein each of said plurality of discrete scintillators is composed of a first layer having a first selected decay time and a second layer having a second selected decay time, wherein said first selected decay time is not equal to said second selected decay time, and further wherein said first layer is composed of a first selected scintillator material and said second layer is composed of a second selected scintillator material and wherein said first and second selected scintillator materials are stacked one upon the other, whereby a pulse shape discrimination technique is used to determine which said layer the gamma ray interacts;

an optical detector associated with each of said plurality of discrete scintillator elements and positioned for sensing and quantifying said scintillation photons exiting each of said plurality of discrete scintillator elements;

a continuous light guide disposed between said plurality of discrete scintillator elements and said associated optical detectors for distributing scintillation photons exiting said plurality of discrete scintillators to said associated optical detectors;

a means operatively associated with said scintillation detector array for determining time, energy, depth and transverse and longitudinal position coordinates of gamma ray interactions in said plurality of discrete scintillator elements.

Claim 2 (original): The scintillator detector array of claim 1 wherein said first and said second layers are composed of High Z scintillator materials.

Claim 3 (original): The scintillator detector array of claim 1 wherein said plurality discrete scintillator elements define a block, wherein a plurality of blocks define an array of scintillator blocks and said plurality of optical detectors define an array of optical detectors positioned adjacent said array of blocks, each of said plurality of scintillator blocks being adjacent one quadrant of each of four of said plurality of adjacent optical detectors.

Claim 4 (original): The scintillation detector array of Claim 1 wherein said plurality of discrete scintillator elements, which interact with incident gamma rays to produce a quantifiable

number of scintillation photons, is arranged in an (m) x (n) array, and said plurality of optical detectors is arranged in an (q) x (p) array, wherein said plurality of optical detectors is for sensing and quantifying said scintillation photons exiting each of said plurality of discrete scintillator elements.

Claim 5 (original): The scintillator detector array of claim 4 wherein said (m) x (n) array equals said (q) x (p) array.

Claim 6 (cancelled):

Claim 7 (original): The scintillator detector array of claim 2 wherein said first and said second layer of each of said plurality of discrete scintillator elements is composed of LSO.

Claim 8 (original): The scintillator detector array of claim 2 wherein said High-Z scintillator material is selected from a group consisting of LSO, LYSO, LGSO, GSO, LuAP, and YAP.

Claim 9 (original): The scintillator detector array of claim 2 wherein said first layer is composed of a first selected scintillator material and said second layer is composed of a second selected scintillator material.

Claim 10 (original): The scintillator detector array of claim 9 wherein said first selected scintillator material and said second selected scintillator material are selected for use in techniques for separating low and high energies.

Claim 11 (original): The scintillator detector array of claim 9 wherein said first selected scintillator material and said second selected scintillator material are selected for use in techniques for determining depth of interaction of the gamma rays with said plurality of discrete scintillator elements.

Claim 12 (original): The scintillator detector array of claim 9 wherein said first selected scintillator material and said second selected scintillator material are selected for use in techniques for distinguishing pulse heights of gamma ray interactions.

Claim 13 (original): The scintillator detector array of claim 1 wherein said first selected scintillator material is YSO and said second selected scintillator material is a High Z scintillator

material.

Claim 14 (original): The scintillator detector array of claim 1 wherein said first selected scintillator material is LSO and said second selected scintillator material is GSO.

Claim 15 (original): The scintillator detector array of claim 1 wherein said first selected scintillator material is YSO and said second selected scintillation material is LSO.

Claim 16 (original): The scintillator detector array of claim 1 wherein said light guide is active.

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Claim 17 (original): The scintillation detector array of Claim 1 wherein said light guide is non-active.

Claim 18 (original): A scintillation detector array for encoding energy, position and time coordinates of gamma ray interactions for use in Positron Emission Tomography imaging, said scintillation detector array comprising:

a plurality of discrete scintillator elements which interact with incident gamma rays to produce a quantifiable number of scintillation photons, wherein each of said plurality of discrete scintillators is composed of a first layer having a first selected decay time and a second layer having a second selected decay time, wherein said first selected decay time is not equal to said second selected decay time, and further wherein said first and said second layers are composed of High Z scintillator materials, and further wherein said first layer is composed of a first selected scintillator material and said second layer is composed of a second selected scintillator material and wherein said first and second selected scintillator materials are stacked one upon the other, whereby a pulse shape discrimination technique is used to determine which said layer the gamma ray interacts;

an optical detector associated with each of said plurality of discrete scintillator elements and positioned for sensing and quantifying said scintillation photons exiting each of said plurality of discrete scintillator elements;

a continuous light guide disposed between said plurality of discrete scintillator elements and said associated optical detectors for distributing scintillation photons exiting said plurality of discrete scintillators to said associated optical detectors;

a means operatively associated with said scintillation detector array for determining time, energy, depth and transverse and longitudinal position coordinates of gamma ray interactions in said plurality of discrete scintillator elements.

Claim 19 (original): The scintillator detector array of claim 18 wherein said plurality discrete scintillator elements define a block, wherein a plurality of blocks define an array of scintillator blocks and said plurality of optical detectors define an array of optical detectors positioned adjacent said array of blocks, each of said plurality of scintillator blocks being adjacent one quadrant of each of four of said plurality of adjacent optical detectors.

Claim 20 (original): The scintillation detector array of Claim 18 wherein said plurality of discrete scintillator elements, which interact with incident gamma rays to produce a quantifiable number of scintillation photons, is arranged in an (m) x (n) array, and said plurality of optical detectors is arranged in an (q) x (p) array, wherein said plurality of optical detectors is for sensing and quantifying said scintillation photons exiting each of said plurality of discrete scintillator elements.

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Claim 21 (original): The scintillator detector array of claim 20 wherein said (m) x (n) array equals said (q) x (p) array.

Claim 22 (original): The scintillator detector array of claim 20 wherein said (m) x (n) array does not equal said (q) x (p) array.

Claim 23 (original): The scintillator detector array of claim 18 wherein said light guide is active.

Claim 24 (original): The scintillation detector array of Claim 18 wherein said light guide is non-active.

Claim 25 (original): A scintillation detector array for encoding energy, position and time coordinates of gamma ray interactions for use in Positron Emission Tomography imaging, said scintillation detector array comprising:

a plurality of discrete scintillator elements which interact with incident gamma rays to produce a quantifiable number of scintillation photons, wherein each of said plurality of discrete scintillators is composed of a first layer having a first selected decay time and a second layer having a second selected decay time, wherein said first selected decay time is not equal to said second selected decay time, and further wherein said first and said second layers are composed of High Z scintillator materials, and further wherein said first layer is composed of a first selected scintillator material and

said second layer is composed of a second selected scintillator material and wherein said first and second selected scintillator materials are stacked one upon the other, whereby a pulse shape discrimination technique is used to determine which said layer the gamma ray interacts;

an optical detector associated with each of said plurality of discrete scintillator elements and positioned for sensing and quantifying said scintillation photons exiting each of said plurality of discrete scintillator elements;

a continuous light guide optically bonded to said plurality of discrete scintillator elements, whereby said plurality of discrete scintillator elements is disposed between said light guide and said optical detectors, wherein said plurality of discrete scintillator elements distribute scintillation photons exiting said plurality of discrete scintillators to said associated optical detectors;

a means operatively associated with said scintillation detector array for determining time, energy, depth and transverse and longitudinal position coordinates of gamma ray interactions in said plurality of discrete scintillator elements.

Claim 26 (original): The scintillator detector array of claim 25 wherein said plurality discrete scintillator elements define a block, wherein a plurality of blocks define an array of scintillator blocks and said plurality of optical detectors define an array of optical detectors positioned adjacent said array of blocks, each of said plurality of scintillator blocks being adjacent one quadrant of each of four of said plurality of adjacent optical detectors.

Claim 27 (original): The scintillation detector array of Claim 25 wherein said plurality of discrete scintillator elements, which interact with incident gamma rays to produce a quantifiable number of scintillation photons, is arranged in an (m) x (n) array, and said plurality of optical detectors is arranged in an (q) x (p) array, wherein said plurality of optical detectors is for sensing and quantifying said scintillation photons exiting each of said plurality of discrete scintillator elements.

Claim 28 (original): The scintillator detector array of claim 27 wherein said (m) x (n) array equals said (q) x (p) array.

Claim 29 (original): The scintillator detector array of claim 27 wherein said (m) x (n) array does not equal said (q) x (p) array.

Claim 30 (original): The scintillator detector array of claim 25 wherein said first and said second layer of each of said plurality of discrete scintillator elements is composed of LSO.

Claim 31 (original): The scintillator detector array of claim 25 wherein said High-Z scintillator material is selected from a group consisting of LSO, LYSO, LGSO, GSO, LuAP, and YAP.

Claim 32 (original): The scintillator detector array of claim 25 wherein said first layer is composed of a first selected scintillator material and said second layer is composed of a second selected scintillator material.

Claim 33 (original): The scintillator detector array of claim 32 wherein said first selected scintillator material and said second selected scintillator material are selected for use in techniques for separating low and high energies.

Claim 34 (original): The scintillator detector array of claim 32 wherein said first selected scintillator material and said second selected scintillator material are selected for use in techniques for determining depth of interaction of the gamma rays with said plurality of discrete scintillator elements.

Claim 35 (original): The scintillator detector array of claim 32 wherein said first selected scintillator material and said second selected scintillator material are selected for use in techniques for distinguishing pulse heights of gamma ray interactions.

Claim 36 (original): The scintillator detector array of claim 32 wherein said first selected scintillator material is YSO and said second selected scintillator material is a High Z scintillator material.

Claim 37 (original): The scintillator detector array of claim 32 wherein said first selected scintillator material is LSO and said second selected scintillator material is GSO.

Claim 38 (original): The scintillator detector array of claim 32 wherein said first selected scintillator material is YSO and said second selected scintillation material is LSO.

Claim 39 (original): The scintillator detector array of claim 25 wherein said light guide is active.

Claim 40 (original): The scintillation detector array of Claim 25 wherein said light guide is non-active.

Claim 41 (re-presented – formerly dependent Claim 6): A scintillation detector array for encoding energy, position and time coordinates of gamma ray interactions for use in Positron Emission Tomography imaging, said scintillation detector array comprising:

a plurality of discrete scintillator elements which interact with incident gamma rays to produce a quantifiable number of scintillation photons, wherein each of said plurality of discrete scintillators is composed of a first layer having a first selected decay time and a second layer having a second selected decay time, wherein said first selected decay time is not equal to said second selected decay time, and further wherein said first layer is composed of a first selected scintillator material and said second layer is composed of a second selected scintillator material and wherein said first and second selected scintillator materials are stacked one upon the other, whereby a pulse shape discrimination technique is used to determine which said layer the gamma ray interacts;

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an optical detector associated with each of said plurality of discrete scintillator elements and positioned for sensing and quantifying said scintillation photons exiting each of said plurality of discrete scintillator elements wherein said plurality of discrete scintillator elements, which interact with incident gamma rays to produce a quantifiable number of scintillation photons, is arranged in an (m) x (n) array, and said plurality of optical detectors is arranged in an (q) x (p) array, wherein said (m) x (n) array does not equal said (q) x (p) array and further wherein said plurality of optical detectors is for sensing and quantifying said scintillation photons exiting each of said plurality of discrete scintillator elements;

a continuous light guide disposed between said plurality of discrete scintillator elements and said associated optical detectors for distributing scintillation photons exiting said plurality of discrete scintillators to said associated optical detectors;

a means operatively associated with said scintillation detector array for determining time, energy, depth and transverse and longitudinal position coordinates of gamma ray interactions in said plurality of discrete scintillator elements.

Claim 42 (new): The scintillator detector array of claim 41 wherein said first and said second layers are composed of High Z scintillator materials.

Claim 43 (new): The scintillator detector array of claim 41 wherein said plurality discrete scintillator elements define a block, wherein a plurality of blocks define an array of scintillator blocks

and said plurality of optical detectors define an array of optical detectors positioned adjacent said array of blocks, each of said plurality of scintillator blocks being adjacent one quadrant of each of four of said plurality of adjacent optical detectors.

Claim 44 (new): The scintillator detector array of claim 42 wherein said first and said second layer of each of said plurality of discrete scintillator elements is composed of LSO.

Claim 45 (new): The scintillator detector array of claim 42 wherein said High-Z scintillator material is selected from a group consisting of LSO, LYSO, LGSO, GSO, LuAP, and YAP.

Claim 46 (new): The scintillator detector array of claim 42 wherein said first layer is composed of a first selected scintillator material and said second layer is composed of a second selected scintillator material.

Claim 47 (new): The scintillator detector array of claim 46 wherein said first selected scintillator material and said second selected scintillator material are selected for use in techniques for separating low and high energies.

Claim 48 (new): The scintillator detector array of claim 46 wherein said first selected scintillator material and said second selected scintillator material are selected for use in techniques for determining depth of interaction of the gamma rays with said plurality of discrete scintillator elements.

Claim 49 (new): The scintillator detector array of claim 46 wherein said first selected scintillator material and said second selected scintillator material are selected for use in techniques for distinguishing pulse heights of gamma ray interactions.

Claim 50 (new): The scintillator detector array of claim 41 wherein said first selected scintillator material is YSO and said second selected scintillator material is a High Z scintillator material.

Claim 51 (new): The scintillator detector array of claim 41 wherein said first selected scintillator material is LSO and said second selected scintillator material is GSO.

Claim 52 (new): The scintillator detector array of claim 41 wherein said first selected scintillator material is YSO and said second selected scintillation material is LSO.

Claim 53 (new): The scintillator detector array of claim 41 wherein said light guide is active.

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Claim 54 (new): The scintillation detector array of Claim 41 wherein said light guide is non-active.